



EVMS Refresher and Update Training

January 2012



Office of Project Management and Oversight



Training Purpose



- This training is provided as part of the Fermilab Office of Project Management Oversight EVMS training series.
 - Refresher of basic concepts
 - Refresher training required annually for CAMs and Project Office personnel performing EVM
 - Review issues (CARs and CIOs) identified during Surveillances/Reviews of the FRA EVMS
 - Attendance of this training will be recorded in Fermilab TRAIN database and become part of your training record



FRA EVMS Basics Refresher

FRA EVMS Refresher Outline



- EVMS Concepts
 - EVMS based on ANSI 748 and DOE O413.3B
 - Basic components of ANSI standard are:
 - Organization
 - Planning, Budgeting, Scheduling
 - Accounting Considerations
 - Analysis and Management Reports
 - Revisions and Data Maintenance

FRA EVMS Documents



- Fermilab projects are under FRA EVM System
 - Documentation found at <http://www.fnal.gov/directorate/OPMO/PolProc/home.htm>
 - System Description, 8 implementing procedures, desktop instructions

Office of Project Management Oversight Policies and Procedures

Policies

[Earned Value Management System Description](#)

OPMO Project Management Procedures

12.PM-001	Project WBS, OBS, RAM	
12.PM-002	Control Accounts, Work Packages, Planning Packages	
12.PM-003	Work Authorization	
12.PM-004	Project Scheduling	Desktop Instructions
12.PM-005	Cost Estimating	
12.PM-006	Monthly Status Reporting	Desktop Instructions
12.PM-007	Change Control	Desktop Instructions
12.PM-008	EVMS Surveillance and Maintenance	

DOE Documents

[DOE Policies, Orders, and Guides](#)

EVMS Data Elements



Performance Formulas

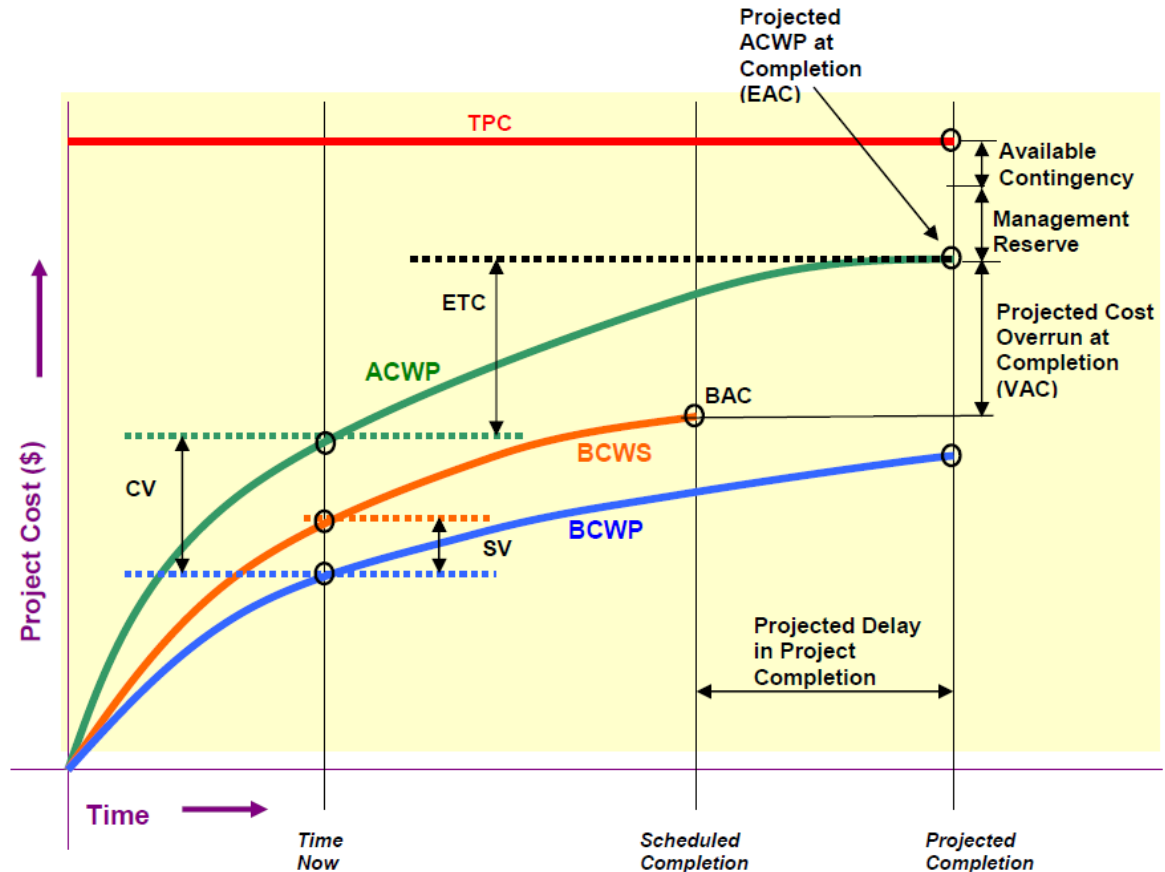
$$CV = BCWP - ACWP$$

$$SV = BCWP - BCWS$$

$$CPI = BCWP / ACWP$$

$$SPI = BCWP / BCWS$$

$$VAC = BAC - EAC$$



Overall Status

$$\text{Percent Complete} = BCWP_{CUM} / BAC$$

$$\text{Percent Spent} = ACWP_{CUM} / BAC \text{ (OR EAC)}$$

Organization



Work Breakdown Structure
developed with a product-oriented
focus

WBS Dictionary defines the scope
of each WBS element

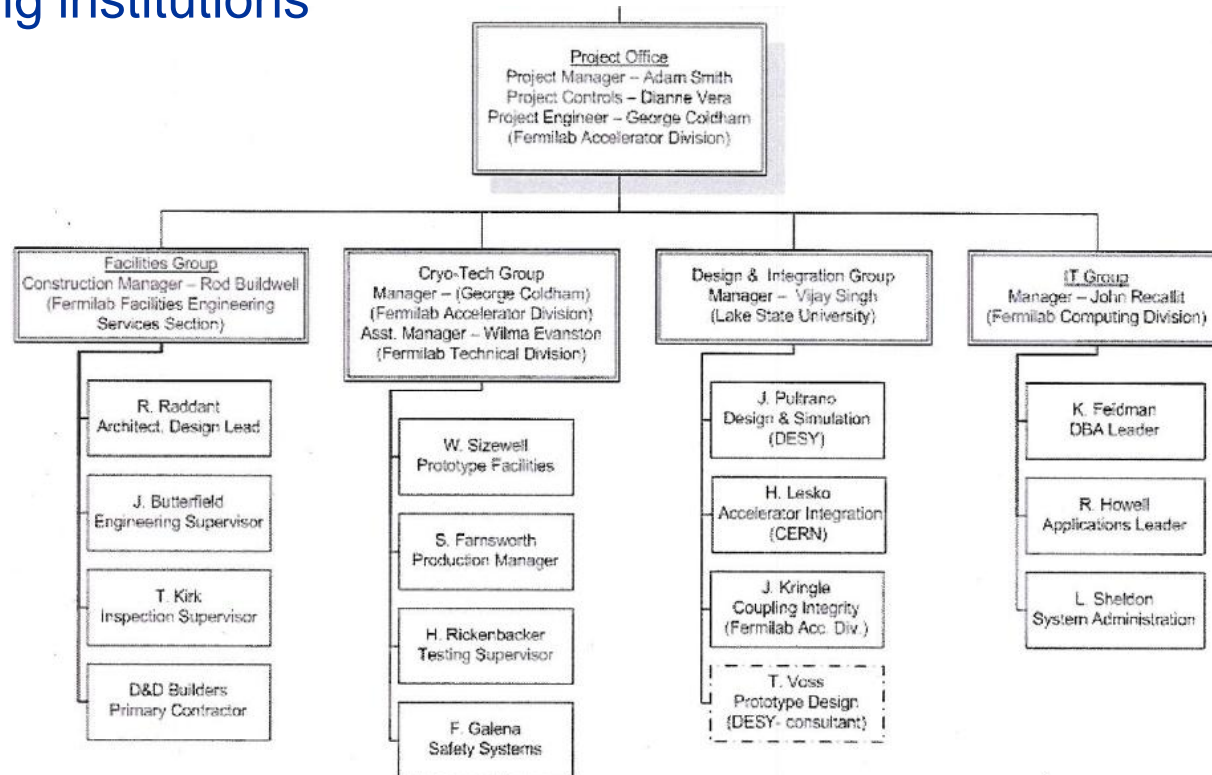
1. 3.			Cryomodule with Quad
1. 3. 1.	Y	25/25.1.3.1	Cryomodule Final Design
1. 3. 2.	Y	25/25.1.3.2	Cryomodule Prototype (CM1)
1. 3. 2. 1.			EDIA for CM1 Components
1. 3. 2. 2.			CM1 Dressed Cavities (8/CM)
1. 3. 2. 2. 1.			Raw Niobium for CM1 Cavity
1. 3. 2. 2. 2.			CM1 Cavity & Helium Vessel
1. 3. 2. 2. 3.			CM1 Cavity Processing
1. 3. 2. 2. 4.			CM1 Cavity Qualification
1. 3. 2. 2. 5.			CM1 Cavity Tuners
1. 3. 2. 2. 6.			CM1 Cavity Dressing
1. 3. 2. 2. 7.			CM1 Cavity Shipping & Handling
1. 3. 2. 3.			CM1 Magnetic
1. 3. 2. 3. 1.			EDIA for CM
1. 3. 2. 3. 2.			CM1 Quad &
1. 3. 2. 3. 3.			CM1 BPM
1. 3. 2. 3. 4.			CM1 Helium
1. 3. 2. 3. 5.			CM1 Current
1. 3. 2. 3. 6.			CM1 Magnet

Contained in Control Account		Proj/Task # 25/25.1.3.3
WBS Element Title		Cavity Processing
Assumptions		
1		Cavities are fabricated by a qualified cavity vendor and are free of weld defects
2		Cavity delivery from vendors is sufficient to always keep processing facility operational
3		Maximum number of process cycles/cavity is three
4		60% of the cavities receive 1 cycle, 30% 2 cycles and 10% 3 cycles
5		BCP and EP process procedures are performed per PN-12345
Relates to Requirements		
1.2.2		Linac technical design parameters
1.5.5.6		Maximum accelerating gradient in the Linac
Scope of Work		
		The Scope of Work includes all activities associated with cavity processing including
1		Receive cavities from vendors and perform QC per PN-23456
2		Setup and perform BCP and EP cycles as defined in PN-12345
3		Perform final HPR per PN-45678
4		Leak check and seal cavity per PN-78910
5		Ship sealed cavity to VTS
Deliverables		
1		Cavities that are processed, sealed and ready for vertical testing
2		Total number of cavities processed equals 320

Organization



Organizational Breakdown Structure is established to ensure the project's scope of work can be efficiently managed (likely to include collaborating institutions)



Organization



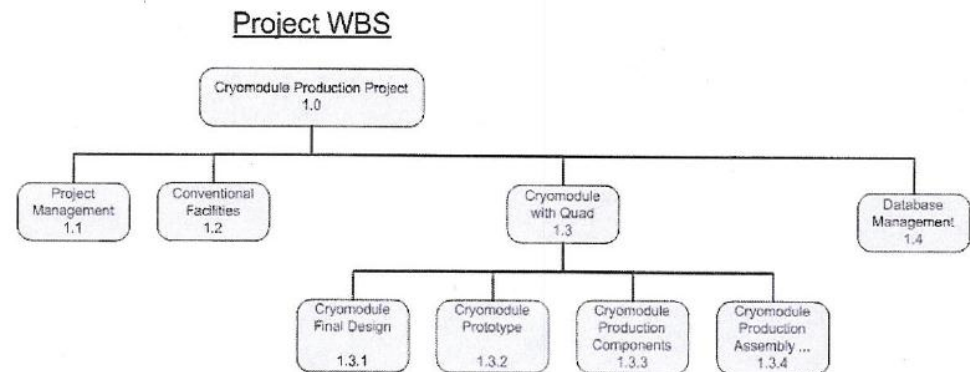
Responsibility Assignment Matrix establishes the key control points (Control Accounts) and the managers of the entire project scope

Project OBS

Project Office
Facilities Group
Design & Integration Group
Cryo-Tech Group
IT Group

25/25.1.1 A. Smith \$300k						
	25/25.1.2 R. Buildwell \$10,000k					
		25/25.1.3.1 V. Singh \$200k				
			25/25.1.3.2 W. Sizewell \$4,500k	25/25.1.3.3 S. Farnsworth \$9,000k	25/25.1.3.4 S. Farnsworth \$1,500k	
						25/25.1.4 J. Recallit \$250k

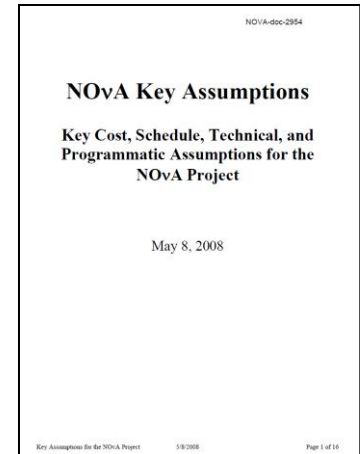
Control Accounts (CA)



Planning, Scheduling and Budgeting



- A key part of baseline planning is establishing the project assumptions
 - This should be initially documented early in the project, and evolve as time progresses.
- Schedule development is an iterative process among the CAM, Functional Managers, Project Controls and the Project Manager
- Work packages and planning packages
 - Work should be planned into detailed planning packages where possible, otherwise, use planning packages to establish a budget, but not work details.
- Risk management is an integral part of the planning process and is key driver in establishing cost and schedule management reserve and contingency
 - Risk register should total to management reserve budget
- A consistent approach should be used in developing and documenting cost estimates across a project



Planning, Scheduling and Budgeting



- **Setting a baseline**
 - Establishes point at which formal change control to the cost, schedule, and technical baseline must start
 - Earned value reporting must begin
- **Work Authorization**
 - Work must be authorized from the Project Manager to the CAMS before it begins
 - Work authorization documentation contains
 - Scope
 - Schedule
 - Time-phased budget (Control Account Plan)
- **Work sent to collaborators requires**
 - Memorandum of Understanding (MOU) documenting expected institutional contributions & responsibilities
 - Statement of Work (SOW) for each fiscal year detailing costs expected to be covered by Fermilab, and executed through purchase requisition/order process

REVISED: DAY-MONTH-YEAR

WORK AUTHORIZATION FORM

Project

Control Account Title: _____

Control Account Number: _____

Control Account Manager: _____

Work Breakdown Structure Element: **WBS.X.X.X**

Period of Performance: ____ to ____

Current Authorized Budget (in AYS with all burdening): \$ _____

Current Authorized Budget for Uncosted Scientist Labor : _____ hours

REVISION HISTORY:

CR#	APPROVAL DATE	CR DOC#	FILE #	PRIOR BUDGET IN \$	NEW BUDGET IN \$	PRIOR UNCONSTED LABOR BUDGET IN HOURS	NEW UNCONSTED LABOR BUDGET IN HOURS	PRIOR PERIOD OF PERFORMANCE

This Work Authorization, including all attachments, represents the agreement between the Project Manager and Control Account Manager (CAM) to perform, or to have performed, efforts defined by the following:

- 1) A WBS Dictionary sheet that defines the scope of work for this WBS element/Control Account. If additional definition is warranted, or required for a particular WBS element, (e.g., QA reasons, Work Orders for third party services, etc) attach applicable documentation.
- 2) A detailed Control Account schedule showing all work packages and planning packages.
- 3) A detailed resource report by WBS and schedule activity.
- 4) Budgeted cost by month at the Work Package level (Control Account Plan)
- 5) Budgeted uncosted labor hours by month at the Work Package level (Control Account Plan)

This Work Authorization is for the lifecycle of the project. Funding will be authorized incrementally based on schedule status and funding availability, and communicated by other means to CAMs. Any change to this document will be implemented through the Change Control procedures.

Reviewed by: _____ Date: _____

Approved: _____ Date: _____

Project Controls Group
Control Account Manager
Project Manager

Date
Date
Date

THE CHARGEABLE TASK CODE(S) FOR A CONTROL ACCOUNT WILL NOT BE OPENED WITHOUT A SIGNED WORK AUTHORIZATION FORM.

Accounting Considerations

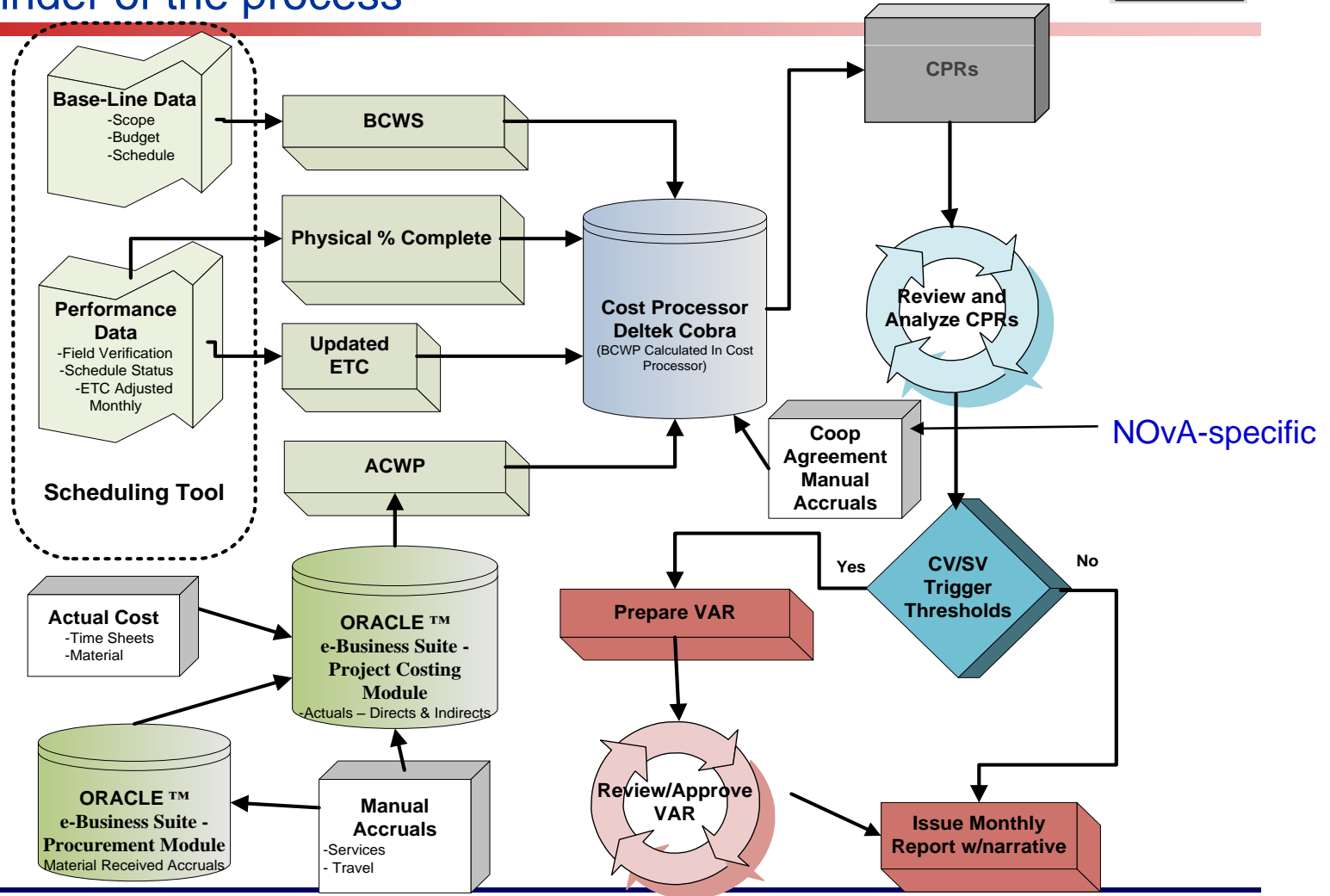


- Fermilab's Oracle eBS (electronic Business Suite) used to collect actual costs
- Accruals done in Oracle eBS
 - Automatic for material received at Fermilab, manual for services & materials received elsewhere
- Kronos used for Fermilab labor
 - Labor at other institutions appears as M&S to Fermilab managers, but is scheduled as "labor" in the Scheduling Tool (i.e. Primavera P6, Open Plan)
- Indirects are applied in Oracle eBS
 - Rates set at least annually by CFO, adjusted at fiscal year end to reflect actual indirect costs at Fermilab, may be adjusted at interim dates
 - opportunities for pass-through rates
 - cap on indirects for large purchase orders at \$500K.
- Actual hours for uncosted Scientist are collected from collaborators on spreadsheets and entered via upload to Cobra monthly
- Actual costs and hours are extracted from eBS and loaded into Cobra monthly (see upcoming graphic on Monthly Status Reporting Cycle)
 - Cobra and eBS totals are reconciled

Monthly Analysis and Management Reporting



- A reminder of the process



Cost Performance Report CPR1



- Produced monthly for CAMs and project manager
- Shows current period and cumulative performance
- Example (partial) from NOvA:

COST PERFORMANCE REPORT FORMAT 1 - WORK BREAKDOWN STRUCTURE													
CONTRACTOR						CONTRACT			PROGRAM			4. REPORT PERIOD	
NAME						NAME			NAME			FROM 01-June-2009	
Fermi National Accelerator Laboratory									NOvA Project			TO 30-June-2009	
PERFORMANCE DATA													
CTC-FndSrc WBS[2] Results...	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED	LATEST REVISED ESTIMATE	VARIANCE
	WORK	WORK	WORK	SCHEDULE	COST	WORK	WORK	WORK	SCHEDULE	COST			
	SCHEDULED	PERFORMED	PERFORMED	SCHEDULE	COST	SCHEDULED	PERFORMED	PERFORMED	SCHEDULE	COST			
ITEM	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
DA DOE-ACEL MIE													
2.0 ANU Construction													
Fully Burdened AY\$k	376	250	106	(126)	144	1,933	1,099	921	(834)	178	31,759	31,720	39
CTC-FndSrcTotals:	376	250	106	(126)	144	1,933	1,099	921	(834)	178	31,759	31,720	39
DC DOE-CA													
2.1 Site and Building													
Fully Burdened AY\$k	664	230	1,177	(434)	(947)	3,342	1,940	2,306	(1,402)	(366)	30,456	30,534	(78)
CTC-FndSrcTotals:	664	230	1,177	(434)	(947)	3,342	1,940	2,306	(1,402)	(366)	30,456	30,534	(78)
DD DOE-ACEL R&D													
1.0 ANU R&D													
Fully Burdened AY\$k	310	345	117	35	229	3,921	2,905	2,592	(1,016)	313	7,863	7,609	254
CTC-FndSrcTotals:	310	345	117	35	229	3,921	2,905	2,592	(1,016)	313	7,863	7,609	254
DE DOE-DET MIE													
2.1 Site and Building													
Fully Burdened AY\$k	67	67	23	0	44	466	466	136	0	331	1,930	1,430	500
2.10 Project Management - Nova Project - Construction													
Fully Burdened AY\$k	76	76	51	0	25	1,022	1,022	810	0	212	6,029	5,824	205
2.2 Liquid Scintillator													
Fully Burdened AY\$k	112	6	7	(106)	(1)	153	28	15	(125)	12	18,544	19,588	(1,044)
2.3 WLS Fiber													
Fully Burdened AY\$k	1	14	0	13	14	5	38	0	34	38	10,084	10,957	(873)
2.4 PVC Extrusions													
Fully Burdened AY\$k	20	10	0	(10)	10	336	46	0	(290)	46	25,325	24,858	467
2.5 PVC Modules													

Cost Performance Report by Control Account



- Produced monthly for CAMs and project manager
- Colors indicate threshold trigger – red requires VAR to be written
- Example (partial) from NOvA for costed resources:

Report Period: Aug-09		Current Period										Cumulative											
Control Account	BCWS (A\$)	BCWP (A\$)	ACWP (A\$)	SV (A\$)	SV (%)	CV (A\$)	CV (%)	SPI	CPI	BCWS (A\$)	BCWP (A\$)	ACWP (A\$)	SV (A\$)	SV (%)	CV (A\$)	CV (%)	SPI	CPI	BAC (A\$)				
R&D																				0			
1.0.0 ANU CDR COSTS	0	0	0	0	0%	0	0%	1.00	1.00	0	0	18,630	0	0%	-18,630	-100%	1.00	0.00	0				
1.0.1 RR Upgrades	28,885	36,082	62,095	7,197	25%	-26,013	-91%	1.25	0.58	2,651,297	1,695,121	1,900,417	-956,175	-36%	-205,296	-12%	0.64	0.89	5,498,231				
1.0.2 MI Upgrades	34,939	49,021	4,036	14,083	40%	44,985	129%	1.40	12.15	337,232	239,910	250,134	-97,322	-29%	-10,724	-4%	0.71	0.96	1,112,863				
1.0.3 NUI Upgrades	104,177	18,049	46,294	-86,128	-83%	-28,245	-100%	0.17	0.39	1,161,268	1,034,181	655,258	-127,086	-11%	-378,923	-37%	0.89	1.58	2,151,871				
1.0.4 ANU Beam Physics	1,767	1,152	0	-615	-35%	1,152	100%	0.65	N/A	75,253	78,843	4,666	3,590	5%	74,176	94%	1.05	16.90	83,255				
1.0.5 ANU Project Management	0	0	0	0	0%	0	0%	1.00	1.00	344,698	344,698	258,692	0	0%	86,006	25%	1.00	1.33	344,698				
1.1 Site and Building R&D	0	0	0	0	0%	0	0%	1.00	1.00	2,274,519	2,274,519	1,626,970	0	0%	647,549	28%	1.00	1.40	2,274,519				
1.2 Liquid Scintillator R&D	2,353	2,310	2,633	-44	-2%	-323	-14%	0.98	0.88	276,064	268,427	257,536	-7,637	-3%	10,391	4%	0.97	1.04	297,296				
1.3 WLS Fiber R&D	962	0	0	-962	-100%	0	0%	0.00	1.00	339,617	313,149	297,127	-26,468	-8%	16,022	5%	0.92	1.05	340,909				
1.4 PVC Extrusion R&D	18,368	7,883	84,714	-10,484	-57%	-76,831	-97%	0.43	0.09	1,347,527	1,134,800	1,505,342	-212,727	-16%	-370,542	-33%	0.84	0.75	1,368,849				
1.5 PVC Module R&D	36,941	11,847	63,796	-25,094	-68%	-51,949	-43%	0.32	0.19	1,474,219	694,361	1,278,582	-779,858	-53%	-584,221	-84%	0.47	0.54	1,860,947				
1.6 Electronics R&D	46,197	54,358	-21,134	8,162	18%	75,493	130%	1.18	-2.57	1,308,939	505,339	792,587	-803,600	-61%	-287,247	-57%	0.39	0.64	1,843,797				
1.7 DAQ R&D	27,519	42,743	83,396	15,224	55%	-40,653	-69%	1.55	0.51	962,783	352,724	1,166,542	-613,818	-63%	-813,818	-231%	0.37	0.30	1,406,960				
1.8 Detector Assembly R&D	4,891	67,650	103,099	62,760	1283%	-35,449	-97%	13.83	0.66	2,183,002	1,239,216	2,429,557	-943,786	-43%	-1,190,341	-96%	0.57	0.51	2,997,719				
1.9 Project Management R&D	0	0	0	0	0%	0	0%	1.00	1.00	9,184,127	9,184,127	9,359,785	0	0%	175,658	2%	1.00	0.98	9,184,127				
Construction																				0			
2.0.1.1 Recycler Ring Modifications	62,725	2,668	32,169	-60,057	-96%	-29,501	-110%	0.04	0.08	380,947	51,006	56,055	-329,941	-87%	-5,049	-13%	0.13	0.91	8,548,382				
2.0.1.2 Recycler Kicker System	45,481	25,224	12,890	-20,257	-45%	12,890	28%	0.55	1.96	895,065	180,217	132,374	-714,848	-80%	-47,843	-5%	0.20	1.36	8,383,974				
2.0.1.3 Recycler Instrumentation	0	197,539	2,595	197,539	100%	194,943	99%	N/A	76.11	6,022	332,192	6,294	326,170	5,417%	325,898	98%	55.17	52.78	1,565,578				
2.0.2.1 MI Modifications	13,796	939	0	-12,857	-93%	939	100%	0.07	N/A	98,456	160,047	184,690	61,591	63%	-24,643	-25%	1.63	0.87	387,063				
2.0.2.2 MI RF Cavities	18,370	32,803	14,573	14,433	79%	18,229	100%	1.79	2.25	74,795	80,044	109,561	5,248	7%	-29,518	-37%	0.73	1,417,766					
2.0.3.1 NuMI Primary Proton Beam	30,351	16,743	21,997	-13,608	-45%	-5,254	-17%	0.55	0.76	333,138	115,756	217,448	-217,383	-65%	-101,692	-89%	0.35	0.53	1,520,354				
2.0.3.2 NuMI Target Hall Technical Components	0	0	0	0	0%	0	0%	1.00	1.00	0	0	0	0	0%	0	0%	1.00	1.00	1,731,802				
2.0.3.3 NuMI Target Hall Infrastructure	35,970	0	0	-35,970	-100%	0	0%	0.00	1.00	66,801	61,662	34,677	-5,139	-8%	26,985	40%	0.92	1.78	1,679,794				
2.0.3.4 NuMI Decay Pipe/Hadron Absorber/Utilities	0	0	0	0	0%	0	0%	1.00	1.00	0	0	0	0	0%	0	0%	1.00	1.00	986,507				
2.0.4 Project Management - ANU - Construction	77,012	77,012	46,176	0	0%	30,837	40%	1.00	1.67	729,899	729,899	432,959	0	0%	296,940	41%	1.00	1.69	5,538,307				
2.1.1 Site Preparation Package	89,567	1,367,433	1,457,474	1,277,866	1,427%	-90,041	-7%	15.27	0.94	2,788,393	4,405,064	4,444,799	1,616,671	59%	-39,735	-1%	1.58	0.99	11,769,937				
2.1.2 Far Detector Building	465,706	693,328	375,885	227,622	49%	317,443	68%	1.49	1.84	1,747,139	2,342,784	1,169,460	595,645	34%	1,173,323	50%	1.34	2.00	20,955,138				
2.1.4 Management - Site and Building - Construction	0	18,592	13,679	18,592	100%	4,913	27%	N/A	1.36	244,753	181,576	70,233	-63,177	-26%	111,343	61%	0.74	2.59	556,370				
2.1.6 Project Management - Nova Project - Construction	72,467	72,467	42,755	0	0%	29,712	41%	1.00	1.69	1,169,894	1,169,894	918,788	0	0%	251,106	21%	1.00	1.27	6,028,557				
2.2.1 Mineral Oil	0	0	0	0	0%	0	0%	1.00	1.00	0	0	0	0	0%	0	0%	1.00	1.00	12,685,556				
2.2.2 Pseudomoments	0	0	0	0	0%	0	0%	1.00	1.00	0	0	0	0	0%	0	0%	1.00	1.00	1,292,777				
2.2.3 Wrenchlifters and Stalls 426	101,090	0	0	-101,090	-100%	0	0%	0.00	1.00	332,060	0	0	-332,060	-100%	0	0%	0.00	1.00	2,245,985				
2.2.4 Blending	3,525	3,525	7,476	0	0%	-3,951	-112%	1.00	0.47	25,013	25,013	22,717	0	0%	2,296	9%	1.00	1.10	753,129				
2.2.5 Transport - Liquid Scintillator	0	0	0	0	0%	0	0%	1.00	1.00	0	0	0	0	0%	0	0%	1.00	1.00	1,462,105				
2.2.6 Management - Liquid Scintillator - Construction	1,946	1,946	2,424	0	0%	-477	-25%	1.00	0.80	13,810	13,810	2,424	0	0%	11,387	83%	1.00	5.70	93,824				
2.3.1 Procurement - WLS Fiber	0	20,963	0	20,963	100%	20,963	100%	N/A	N/A	0	63,411	0	63,411	100%	63,411	100%	N/A	N/A	84,374				
2.3.2 Production - WLS Fiber	0	0	0	0	0%	0	0%	1.00	1.00	0	0	0	0	0%	0	0%	1.00	1.00	9,961,576				
2.3.3 Management - WLS Fiber - Construction	906	906	0	0	0%	906	100%	1.00	N/A	6,426	6,426	0	0	0%	6,426	100%	1.00	N/A	37,646				
2.4.1 Procurement - PVC Extrusions	4,765	2,721	0	-2,043	-43%	2,721	100%	0.57	N/A	18,371	10,771	0	-7,600	-41%	10,771	100%	0.59	N/A	178,697				
2.4.2 Extrusion Pre-Production	0	0	0	0	0%	0	0%	1.00	1.00	0	0	0	0	0%	0	0%	1.00	1.00	1,177,552				
2.4.3 Extrusion Production	0	0	0	0	0%	0	0%	1.00	1.00	0	0	0	0	0%	0	0%	1.00	1.00	21,760,938				

Cost Performance Report at Customer Reporting Level



- To be included in monthly report
- Colors indicate threshold trigger
- Example from NOvA (WBS L2) for costed resources:

Report Period: Jun-09														
WBS Level 2	Current Period							Cumulative						
	BCWS (AY\$)	BCWP (AY\$)	ACWP (AY\$)	SV (AY\$)	SV (%)	CV (AY\$)	CV (%)	BCWS (AY\$)	BCWP (AY\$)	ACWP (AY\$)	SV (AY\$)	SV (%)	CV (AY\$)	CV (%)
R&D														
1.0 ANU R&D	310,369	353,815	124,333	43,446	14%	229,482	65%	4,233,200	3,191,938	2,762,635	-1,041,262	-25%	429,302	13%
1.1 Site and Building R&D	0	0	3,925	0	0%	-3,925	-100%	2,274,519	2,274,519	1,638,963	0	0%	635,556	28%
1.2 Liquid Scintillator R&D	0	0	15,518	0	0%	-15,518	-100%	271,245	263,551	241,258	-7,694	-3%	22,293	8%
1.3 WLS Fiber R&D	10,934	5,866	10,545	-5,068	-46%	-4,679	-43%	337,692	313,149	297,127	-24,544	-7%	16,022	5%
1.4 PVC Extrusion R&D	29,435	71,385	45,150	41,950	143%	26,235	37%	1,286,072	1,069,567	1,143,714	-216,505	-17%	-74,147	-7%
1.5 PVC Module R&D	30,081	54,308	45,120	24,226	81%	9,187	17%	1,390,153	673,307	1,132,406	-716,846	-52%	-459,099	-68%
1.6 Electronics R&D	156,635	25,605	150,594	-131,030	-84%	-124,989	-48%	1,126,168	449,127	730,462	-677,041	-60%	-281,335	-63%
1.7 DAQ R&D	155,720	24,126	81,512	-131,593	-85%	-57,385	-23%	834,048	261,621	1,020,368	-572,426	-69%	-758,746	-290%
1.8 Detector Assembly R&D	261,308	66,551	179,189	-194,757	-75%	-112,638	-16%	2,004,466	1,144,490	2,262,902	-859,976	-43%	-1,118,412	-98%
1.9 Project Management R&D	0	0	0	0	0%	0	0%	9,184,127	9,184,127	9,359,785	0	0%	-175,658	-2%
Construction														
2.0 ANU Construction	376,171	250,046	105,661	-126,125	-34%	144,385	58%	1,932,996	1,099,212	920,862	-833,784	-43%	178,350	16%
2.1 Site and Building	731,573	297,128	1,199,990	-434,445	-59%	-902,862	-304%	3,808,256	2,406,618	2,442,185	-1,401,638	-37%	-35,567	-1%
2.10 Project Management - Nova Project - Construction	75,918	75,918	51,269	0	0%	24,649	32%	1,021,510	1,021,510	809,802	0	0%	211,708	21%
2.2 Liquid Scintillator	111,636	5,732	7,152	-105,904	-95%	-1,419	-25%	152,686	27,620	15,241	-125,066	-82%	12,379	49%
2.3 WLS Fiber	949	13,527	0	12,578	1336%	13,527	100%	4,571	38,112	0	33,541	734%	38,112	100%
2.4 PVC Extrusions	19,906	9,701	0	-10,205	-51%	9,701	100%	336,104	45,976	0	-290,129	-86%	45,976	100%
2.5 PVC Modules	15,879	15,879	38,240	0	0%	-22,361	-141%	115,642	115,642	38,240	0	0%	77,402	67%
2.6 Electronics	826	826	879	0	0%	-53	-6%	3,982	3,982	879	0	0%	3,103	78%
2.7 DAQ	235	235	0	0	0%	235	100%	1,128	16,983	0	15,855	1405%	16,983	100%
2.8 Near Detector Assembly	1,774	1,774	0	0	0%	1,774	100%	96,250	84,160	46,427	-12,090	-13%	37,733	45%
2.9 Far Detector Assembly	10,939	10,939	26,997	0	0%	-16,057	-147%	267,041	83,030	36,357	-184,012	-69%	46,672	58%
R&D SubTotal (WBS 1.0-1.9)	954,482	601,656	655,886	-352,826	-37%	-54,230	-9%	22,941,690	18,825,396	20,589,619	-4,116,294	-18%	-1,764,223	-9%
Construction SubTotal (WBS 2.0-2.10)	1,345,807	681,705	1,430,187	-664,102	-49%	-748,482	-110%	7,740,168	4,942,845	4,309,993	-2,797,323	-36%	632,851	13%
Project Total	2,300,288	1,283,361	2,086,073	-1,016,927	-44%	-802,713	-63%	30,681,858	23,768,240	24,899,613	-6,913,618	-23%	-1,131,372	-5%

Variance Analysis

Control Account Reporting Thresholds



Variance Analysis Thresholds for Control Accounts		
Green Thresholds – Cost and Schedule Performance falling outside of yellow or red thresholds		
Yellow Thresholds		
Cost Variance Schedule Variance	Type	Threshold limit
Dollars	Current Period	$\geq \pm 5\%$ to $< \pm 10\%$ and $\geq \$50K$
	Cumulative	$\geq \pm 5\%$ to $< \pm 10\%$ and $\geq \$100K$
Hours	Current Period	$\geq \pm 5\%$ to $< \pm 10\%$ and ≥ 350 hrs
	Cumulative	$\geq \pm 5\%$ to $< \pm 10\%$ and ≥ 700 hrs
Red Thresholds		
Cost Variance Schedule Variance	Type	Threshold limit
Dollars	Current Period	$\geq \pm 10\%$ and $\geq \$100K$
	Cumulative	$\geq \pm 10\%$ and $\geq \$200K$
Hours	Current Period	$\geq \pm 10\%$ and ≥ 700 hrs
	Cumulative	$\geq \pm 10\%$ and ≥ 1400 hrs

Note: This applies to SV% (Schedule Variance in %) or CV% (Cost Variance in %) and the SV or CV in \$ or hours.

- Apply at Control Account level
- Red trigger requires variance analysis report to be written
- Default thresholds – more restrictive thresholds can be used with customer and senior management approval

Variance Analysis

Customer Reporting Thresholds



Customer Variance Analysis Report Thresholds		
Green Thresholds – Cost and Schedule Performance falling outside of yellow or red thresholds		
Yellow Thresholds		
Cost Variance Schedule Variance	Type	Threshold limit
Dollars	Current Period	$\geq \pm 5\%$ to $< \pm 10\%$ and $\geq \$125K$
	Cumulative	$\geq \pm 5\%$ to $< \pm 10\%$ and $\geq \$250K$
Hours	Current Period	$\geq \pm 5\%$ to $< \pm 10\%$ and ≥ 875 hrs
	Cumulative	$\geq \pm 5\%$ to $< \pm 10\%$ and ≥ 1750 hrs
Red Thresholds		
Cost Variance Schedule Variance	Type	Threshold limit
Dollars	Current Period	$\geq \pm 10\%$ and $\geq \$250K$
	Cumulative	$\geq \pm 10\%$ and $\geq \$500K$
Hours	Current Period	$\geq \pm 10\%$ and ≥ 1750 hrs
	Cumulative	$\geq \pm 10\%$ and ≥ 3500 hrs

Note: This applies to SV% (Schedule Variance in %) or CV% (Cost Variance in %) and the SV or CV in \$.

- Apply at project/customer determined level – NOvA is WBS L2
- Red trigger requires variance analysis report to be written
- Default thresholds – more restrictive thresholds can be used with customer and senior management approval

Variance Analysis Reports (VAR)



- To be written when red threshold is triggered
- VARs to be reviewed by Project Manager and iterated if necessary
- VARs to be signed by the CAM as the Prepare and Approved by the Project Manager in a timely manner (VARs to be approved by end of monthly cycle – i.e. VAR on Oct data to be approved by end of Nov)
- Corrective actions to be reviewed at project meetings (with all CAMs to look for impacts across separate Control Accounts)
- Corrective Action Log to be statused regularly (i.e. monthly)

VARIANCE REPORT CORRECTIVE ACTION LOG						
ID#	Control Account (CA) #	FOR REPORT MONTH/YR		APPROVAL DATE	CLOSED DATE	RESPONSIBILITY (CAM)
1	1.0.1	Oct-08	None needed. In future, will work with Project Controls office to schedule accruals to mitigate variance effects.	2-Jan-09	17-Mar-09	Derwent
2	1.0.2	Oct-08	The CAM had an extensive talk with the level 4 managers about the importance of using the correct codes for effort reporting. We are taking every effort to communicate to everyone working for the project what appropriate codes to use. There was no incorrect effort reporting in October. The CAM also will be looking at the monthly effort reports now available to check that people are reporting their efforts correctly.	22-Dec-08	17-Mar-09	Kourbanis
3	1.0.3	Oct-08	The labor efforts under Control Account 1.0.3 will continued to be monitored to determine if the over estimates of labor remain consistent. If so, the estimates for future tasks can be reviewed.	16-Dec-08	17-Mar-09	Martens
4	1.0.4	Oct-08	The CAM will monitor these tasks knowing that the schedule and cost variances should eventually come within the limits, and are not (presently) indicative of true progress.	16-Dec-08	17-Mar-09	Zwaska
5	1.0.5	Oct-08	We will correct the ~thousand dollars of incorrect charges in FY09. We can not correct the incorrect charges in past FY's and thus most of this variance will remain. I have sent out e-mail to all the people working on this project speaking to the importance of using the correct codes for effort reporting. I have clarified with people the items that are considered "management" and should be charged to the 2.0.4 code (1.0.5 is now closed).	29-Dec-08	17-Mar-09	Derwent
6	1.2	Oct-08	The IU SOW will soon be in place and this work will take place starting in the second quarter of FY09. Since this work took only 1/2 time tech hours, 1.2 can catch up with the most of the planned work by the end of the June 30.	20-Dec-08	17-Mar-09	Mufson

Variance Analysis Report Example



By Control Account

Explanation addresses triggered variances

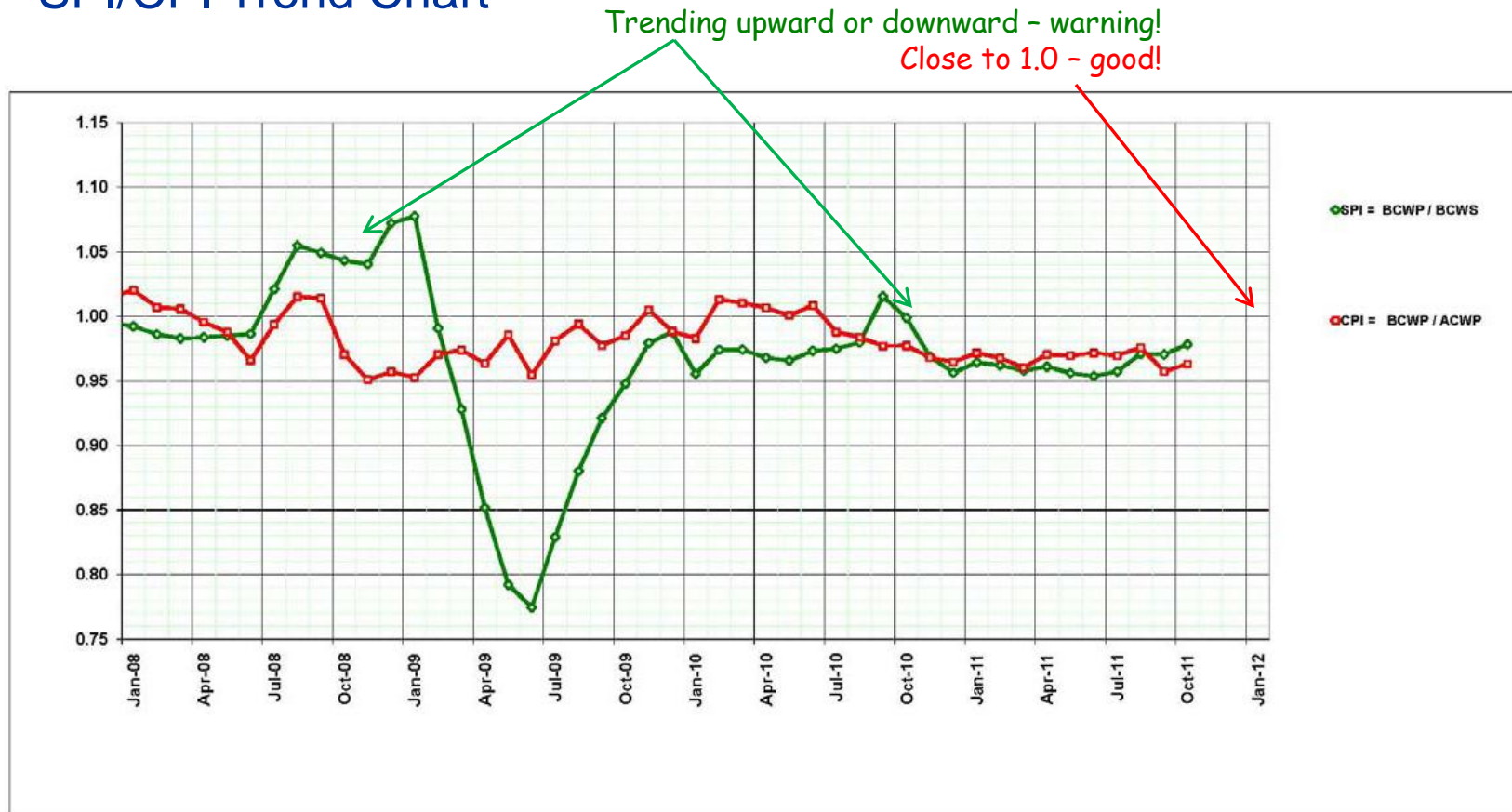
Provides corrective action

CLASSIFICATION (When Filled In)									
CONTRACT PERFORMANCE REPORT FORMAT 5 - EXPLANATIONS AND PROBLEM ANALYSES								FORM APPROVED OMB No. 0704-0188	
1. CONTRACTOR		2. CONTRACT		3. PROGRAM		4. REPORT PERIOD			
a. NAME Fermi National Accelerator		a. NAME		a. NAME NOvA Project		a. FROM (YYYYMMDD) 2009/02/01			
b. LOCATION (Address and City, State, Zip)		b. NUMBER		b. PHASE		b. TO (YYYYMMDD) 2009/02/28			
		c. TYPE		d. SHARE RATIO		c. EVMS ACCEPTANCE (YYYYMMDD) NO X YES			
1.0.3 NUMI Upgrades									
	BCWS	BCWP	ACWP	SV in \$	SV in %	CV in \$	CV %	SPI	CPI
Current:	238,849	20,992	31,614	-217,857	-91%	-10,622	-4%	0.09	0.66
Cumulative	411,941	771,482	426,192	359,540	87%	345,290	45%	1.87	1.81
	BAC	EAC	VAC in \$	VAC in %	CPI to BAC	CPI to EAC			
At Complete	2,118,285	1,761,275	357,010	17%	0.80	1.01			
Thresholds Exceeded: Current Period Schedule, Current Period Cost, Cumulative Schedule, Cumulative Cost									
Explanation of Schedule Variance:									
In December 2008 the NOvA project was rebaselined to start in February 2009 with the expectation that funding would be restored by the US Congress at that time. In the summer of 2008 a supplemental appropriations bill provided funding for the NOvA project earlier than expected but the project was not rebaselined. With funding and resources available, work began within control account 1.0.3 ahead of schedule. Beginning work early helps mitigate NOvA risk #95 (see Nova docdb 2841) which is the potential lack of Accelerator Division personnel. Therefore the work is cumulatively ahead of schedule.									
Starting in February 2009, the amount of scheduled work for the month was greater than the amount actually performed for the month, but there still remains a cumulative positive schedule variance. The plot (seen below) of the BCWP and ACWP shows that we have not ramped up the pace of work on control account 1.0.3 to match the start of the baseline schedule.									
Explanation of Cost Variance:									
The cost variance has been steadily growing and is due to a systematic over estimate of the manpower needed to complete the tasks. The plot (seen below) shows that the CPI has consistently remained between about 1.7 and 2.1.									
Corrective Action:									
To address the schedule progress the CAM for 1.0.3 will work with the support departments and Level 4 managers to make sure that labor resources are assigned to the upcoming tasks. To address the cost variance, the best choice is to revise the estimate at completion (EAC) downward by \$300k to \$1.82M.									
Monthly Summary (to include technical causes of VARs, Impacts) and Corrective Action(s):									
The tasks under Control Account 1.0.3 are ahead of schedule, but the recent pace of progress has not kept up with the scheduled pace. The task are under budget since there has been a systematic over-estimate of the manpower requirements. The CAM for 1.0.3 will work to make sure resources are assigned to the upcoming tasks and recommends revising the EAC from \$2.11M to \$1.81M.									
Prepared by: Mike Martens				Date: 03/25/09		Approved by:		Date:	

Other Useful EV Chart



SPI/CPI Trend Chart



Monthly Reports



- Monthly project reports must include earned value information
- Earned value information to be included:
 - Status of key milestones
 - Progress narrative
 - Baseline change control log actions
 - Project management comments
 - EVMS data
 - Variance explanations (if required)
- Narratives may be included to provide more information about the project
- Monthly Reports to be issued timely **(Oct Report issued by end of Nov)**

Estimate to Complete/Estimate at Completion



- Provides a forecast by the project manager and CAMS of cost of the project at completion

Est. At Comp.

Act. Cost of Work Perf.

Est. To Comp.

- $EAC = ACWP + ETC$

- ETC is a forecast. There are multiple ways to forecast using the Scheduling Tool (Primavera P6 or Open Plan and Cobra

Budgeted Cost of Work Remaining

- “Statistical” → $ETC = PF * (BAC - BCWP)$

- “Manual” → ETC based on re-estimate (if any) of remaining work quantities/M&S direct costs

- Statistical method results can be used as reference for ETC analysis. Manual method, calculated at the work package level, based on specifying remaining quantities/costs on each lowest-level activity.

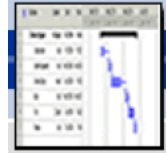
- EAC forecast changes may become baseline changes when they are no longer estimates

EAC/ETC Process Summary



- EAC/ETC changes are a forecast, not changes to the baseline.
- CAMs and the Project Manager to evaluate ETC on a regular basis and discuss
- When substantive changes to the ETC appear on the horizon, CAMs submit the necessary ETC changes to the PM for approval and for subsequent incorporation into the working/forecast schedule and Cobra by Project Controls. ETC changes may also be initiated directly by the Project Manager.
- In addition to changes in resource assignments that affect the ETC, use this change process to incorporate and document
 - Major schedule changes outside the usual ones that occur monthly thru progress reporting
 - Significant labor rate or indirect rate adjustments
 - Changes to bottoms-up contingency estimate percentages*

EAC/ETC Process Summary (continued)



- Log the ETC changes

NOvA Log of Estimate to Complete Changes					27-Apr-09	
ETC#	Item	WBS items	CAM	estimated amount	approved?	date of email approval
1	Labor reductions on 1.0.3	1.0.3.2, 1.0.3.3	Martens	< \$100K decrease in base estimate	yes	15-Apr-09
2	Near Cavern updated estimate following Conceptual design by Harza, checked by Wightman	2.8.1.4.5, 2.8.1.4.6	Lukens	only \$20K increase in base estimate, but a change in contingency estimate from 100% to 50%	yes	15-Apr-09

- Update BOE documentation
- On at least an annual basis, the project manager will request that all CAMs review their ETC, and submit a detailed, bottoms-up estimate for the remaining work to establish the EAC

Revisions and Data Maintenance (Change Control Process)



- Changes are only done on work in the future, not to change past performance
- Change Control Thresholds are project specific
 - High level thresholds (DOE's) are identified in the Project Execution Plan (PEP).
 - Lower level thresholds (FRA's) are identified in the Project Management Plan (PMP)
- NOvA example

	DOE THRESHOLDS				FRA THRESHOLDS		
	Secretarial Acquisition Executive (Level 0-A) Deputy Secretary	Acquisition Executive (Level 0-B) SC-1	Associate Director OHEP (Level 1)	DOE NOvA Federal Project Director (Level 2)	Fermilab Associate Director (Level 3)	NOvA Project Manager (Level 4)	Subproject Manager (Level 5)
Technical	A change in scope that affects the ability to meet a Key Performance Parameter (KPP) and the ability to satisfy the mission need.	A change in scope that affects the ability to meet a KPP and the ability to satisfy the mission need.	Any change in the KPPs as referenced in PEP section 3.2.	Any significant change to the technical scope (as described in PEP sect. 5) that affect ES&H requirements or meeting Project Closeout definitions in PEP Table 7.2.	Major technical changes that are significant departures from the technical baseline. Changes that affect ES&H or impact PoT projections by more than 10%. Out-of-scope changes to upgrade physics capabilities.	Related technical changes to multiple subprojects that do not diminish performance	Minor technical changes to a single subproject that does not diminish performance
Schedule	≥ 6 month (cumulative) delay in the CD-4 completion date.	a 3 to 6 month (cumulative) delay in the CD-4 project completion date.	Any change to a level 1 milestone > 3 months, or up to a 3 month delay in CD-4 project completion date .	Any change to a Level 2 milestone > 1 month or a Level 1 milestone < 3 months.	Any change that results in the delay of a Level 3 Director's milestone.	Any change that results in the delay of a Level 4 milestone by more than one month.	Any change that results in the delay of a Level 5 milestone by more than one month
Cost	Increase in excess of \$25M or 25% (cumulative) of the CD-2 Total Project Cost baseline.	Any increase in the CD-2 Total Project Cost baseline.	Any change in Total Estimated Cost or Total Project Cost.	Any cumulative use of contingency of > \$1M.	Increase in the cost of a single item by more than \$250k. Increase in the Project base cost exceeding \$500k during the previous 12 months.	Increase in the cost of a single item by more than \$100k.	Increase in the cost of a single item by more than \$25k.

- | <i>CR#</i> | <i>WBS</i> | <i>Description of Change</i> | <i>Date</i> | <i>Level</i> | <i>Cost Impact</i> | <i>Schedule Impact</i> | <i>From Contingency or Mang Res Funds</i> | <i>Approval Status</i> |
|------------|------------|--------------------------------------|-------------|--------------|--------------------|------------------------|---|------------------------|
| 001 | | | | | | | | |
| 002 | | | | | | | | |
| 003 | | | | | | | | |
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| | | Total Cost of Changes | | | 0 | | | |
| | | | | | | <hr/> | | |
| | | Original Baseline Management Reserve | | | 0 | | | |
| | | Changes | | | 0 | | | |
| | | Remaining Management Reserve | | | 0 | | | |
| | | | | | | <hr/> | | |
| | | Original Baseline Contingency | | | 0 | | | |
| | | Changes | | | 0 | | | |
| | | Remaining Contingency | | | 0 | | | |

Key to Implementing a EVMS



Timeliness

- Progressing/Forecasting
- Analysis
- Corrective Action
- Change Control
- Reporting



Internal Surveillance/Review March 2011 CARs and CIOs

Corrective Action Reports (CARs)



- EAC – Not Utilized correctly on the project
- Change Requests to Eliminate Variances, Timing of CR Implementation
- Variance Analysis - Not timely, not consistently used by project
- Variance Analysis Corrective Action Tracking
- Uncosted Scientific Labor Charging Inaccurately
- CAM Refresher Training not Performed
- Risk Assessment not conducted Regularly
- Objective Measurement of EV

Continues Improvement Opportunity (CIOs)



- Actual Cost Reconciliation
- Contingency /MR - Not Consistently Handled by the Project
- Use and Integrity of Scheduling Data
- Documentation Inconsistencies
- EVM Implementation

CAR-01 - EAC – Not Utilized correctly on the project



- The EAC is being analyzed at the Project level. In interviews with the CAMs, the CAMs indicated they have no input to the EAC. It was found that when the CAMs do their monthly status report, they do not perform an analysis of the project risks (see CAR10) nor do the CAMs include proposed change requests in the EAC.
- When asked how the ETC was calculated, it was mentioned that the ETC is calculated by Project Controls not the CAM based on the percent complete on the individual resources at the activities/work package level. CAM Interviews indicated that the CAMs provide little input into the ETC/EAC and have limited understanding/ownership of their respective EACs. ETC is being used as the percent complete against an activity/work package and does not include the work that has been performed ($ETC = BAC - BCWP$).
- Interviewed CAMs indicated that they do a bottoms-up EAC prior to major DOE reviews which appear to occur annually.
- Also, as identified in CAR-10, the CAMs review/input into the Project risk registry is minimal. According to the system description, risk analysis should be a part of the monthly status report so it can be included in the EAC analysis.

CAR-02 - Change Requests to Eliminate Variances, Timing of CR Implementation



Change Request to Eliminate Variances

- CR276 “Schedule Adjustments for 53MHz RF System Fabrication and Testing” changes the baseline schedule according to a replanning effort for an ongoing activity. The fact that these changes were made without splitting the activity into past and future work packages jeopardizes the integrity of past performance data.

Timing of CR Implementation

- CR238 “Schedule Adjustments for Selected Detector Assembly Tasks with Baseline Start Dates in Oct 2010” changes the baseline schedule from having start dates in Oct 2010 to start dates in Jan 2011. The CR was initiated on 11/16/2010, received “preliminary approval” on 11/16/2010” but did not receive final approval until 1/7/2011. According to discussions with the Project Scheduler during the interview process, changes to the PMB were made in Nov 2010 prior to the final approval of the CR. In discussions with Project personnel this practice is implemented in multiple areas within the project.
-

CAR-03 - Variance Analysis - Not timely, not consistently used by project



- Based on an assessment of the project's document database, VARs are not completed in a timely manner during the monthly status cycle. VARs were sampled for WBS 2.0.1.2 and resulted in uncovering October, November, and December VARs were not prepared, approved, or fully signed until February. This lag in generation versus final approval implies that the information is not being review in a timely manner and therefore not possibly being used by senior management. After further interviews with the PM, CAMS, and Project Controls it was determined that VARs have no formal deadline for completion or approval at the CAM and PM level. A clear project business process/monthly update cycle regarding the VAR process and utilization of its information for management decision-making is absent from the PEP.

CAR-05 - Variance Analysis Corrective Action Tracking



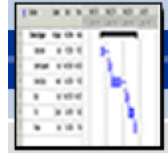
- The CAMs interviewed prepare variance analysis reports based on thresholds established for the project. The variance analysis reports identify the cause, impact and corrective action (if required); and the variance analysis reports are reviewed and accepted by the project manager. Based on interviews with the CAMs and discussions with the project manager/project controls, the project does not currently maintain a corrective action log to track closure of the corrective actions documented on the variance reports as required by the FRA EVMS System Description and implementing procedure. The corrective actions identified in the variance analysis are not formally tracked to closure. The project personnel do not track the closure of corrective actions outlined in the project variance analysis.
- A Corrective Action Log is not created or maintained and for this reason the FRA EVM System Description/Procedure requirement for a Corrective Action Log to track corrective actions to closure is non compliant.

CAR-06 - Uncosted Scientific Labor Charging Inaccurately



- CAMs interviewed that are uncosted scientists stated that they charge an estimated or an average time per week to the project. They do not report time based on the actual hours worked. They indicated that they work more hours for the project than they charge to the project.

CAR-07 - CAM Refresher Training not Performed



- The CAMs would benefit from CAM Refresher Training on an annual basis consistent with the requirement in the FRA System Description. The CAMs would then be better prepared to generate variance analysis, prepare EACs, understand and better understand the project schedule, assess risks and prepare change requests with regular annual EVMS refresher training.

CAR-10 - Risk Assessment not conducted Regularly



- Following the interview with project management and CAMs, it appears that the project performs limited risk management; however, it is referred to as contingency management. However, the contingency application to activities is not contingency it is management reserve per the definitions in the System Description. It was explained that MR (assigned contingency) is assigned at the activity level based on the remaining budget of the activity. As activities are completed, assigned contingency is transferred to unassigned contingency. However, not much is correlated to the risk event list that qualifies/quantifies management reserve.
- During interviews with project management and CAMs, it was discovered that the projects discusses risk events, but the project does not formally conduct regular risk analysis. And, the most current evidence of risk analysis is an outdated risk list that was updated August 2010. It was also discovered that formal risk identification, analysis, modification and retirement are done prior to major reviews, which is when the last formal update was done. The risk registry that is loaded on the surveillance review webpage contains a lot of relevant information; however, it does not quantify those events.

CAR-10 - Risk Assessment not conducted Regularly (continued)



- Based on the requirement/expectation detailed in the project's Risk Management Plan, risk identification, retirement and updates are to occur on a regular basis; and the information derived from those regularly scheduled meetings be reported to the appropriate stakeholders. It was observed that the project does not meet regularly to formally document risk updates; again, this is only contingent upon major DOE reviews.
- Based on the requirements/expectation detailed in the Laboratory's EVM-SD, "As the project progresses, new information and insights allow the Project Manager to refine the identified risks and mitigation strategies or remove the risk from consideration once it is no longer applicable. This is accomplished through regular reviews of project risks by Control Account Managers (CAM) as they analyze cost and schedule variances, develop corrective actions, and execute the corrective actions to completion. In addition, risks are considered during the development of Estimates to Complete (ETC) by the CAM." It is clear that the project manager is aware of potential impacts and/or opportunities; however, that awareness is not documented anywhere. There was no evidence provided to the team that a Risk Management Board exists for the project, nor is there clear evidence that the Level 2 managers are fully integrated into the formal process of risk management. There does not seem to be any evidence of fluctuations in remaining contingency.

CAR-12 - Objective Measurement of EV



- Based on the requirements set forth in FRA's System Description and guidelines from NOvA's Implementation of FRA's Earned Value Management System, CAMs are required to develop activities for their respective control account(s). While developing those activities, the CAMs are required to plan activities with durations that do not exceed two financial periods (two months); and if those durations exceeded two periods, an objective method for performance is to be used to effectively measure earned value. Based on interviews with the CAMs and the project controls personnel assigned to the project, it was discovered that there were activities that exceeded two periods without documented, objective milestones for objective performance measurement. Currently, there are 107 planned or in progress activities that have durations that range from 40 to 250 working days that do not have any objective performance measure documented. The total cost of these planned/in progress activities is ~\$9M, which is 3.8% of the project's cost (this percent does not include already completed activities; the total percent impact could be higher.) Occurrences of this lack of objective measurement were not limited to one control account; there were several instances throughout the schedule that were not in compliance with the documentation referenced above.
- Effective, objective measurement was not established for all activities that exceeded a two month duration. This is not in line with FRA's EVMS System Description, and as a result non compliances exist for those activities without objective performance metrics.

CIO-05 - Actual Cost Reconciliation



RECOMMENDATION:

- It is recommended that the actual cost file be validated by the Finance Group and entered into the EV system by a person in Project Controls to ensure the integrity of the Actual Cost data reported on a monthly basis.

CIO-08 - Contingency /MR - Not Consistently Handled by the Project



Summarized:

- Contingency/MR that was part of the Conventional Construction Building contract was held in a activity/Work Package (WP) and should have been in a Planning Package (PP) instead. Then moved to a WP when the scope of work was identified via Change Request.

CIO-09 - Use and Integrity of Scheduling Data



Recommendation:

- As a best practice, the CAMs should be required to understand their milestones and inter-dependencies of tasks and how they impact the project. The PM should be encouraged/trained in the development and use of relevant milestones. The NOvA project schedule should be adjusted to incorporate more meaningful internal milestones rather than the external scheduled milestones (e.g. DOE CD4) to allow the CAMs to understand the true critical path. Project controls and the CAMs should work together on the schedule with the CAMs actually taking ownership of the schedule.

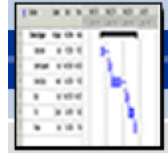
CIO-11 - Documentation Inconsistencies



Summarized:

- The scope definition document in the WBS dictionary is the control point for the work-scope content in each element. The WBS Dictionary definitions are not consistent between the highest level of the WBS and the control account (lowest level of the WBS).
- It is the review team's understanding that FRA is still contractually held to DOE 413.3A which references ANSI Standard 748-A. However, various documents (Monthly Status Reporting, EVMS Surveillance document) are inconsistent in referencing 748-A. Recommend keeping all documents consistent with contractual requirements.

CIO-13 - EVM Implementation



RECOMMENDATION:

- In order for the Project Controls staff to implement Earned Value management for the benefit of the project, it is recommended that the project controls staff report organizationally to an autonomous group which would allow for the most effective, value added objective assessment of project performance. This recommendation would benefit the project enabling the Project Controls staff to provide objective performance measurement, reporting and oversight to the project. Centralizing Project Controls affords the project and future projects an opportunity to standardize tools, templates, performance assessment and reporting across the Laboratory.